IN THE UNITED STATES DISTRICT COURT
FOR THE WESTERN DISTRICT OF PENNSYLVANIA

N.A. WATER SYSTEMS, LLC	)	
	)	
Plaintiff,	)	
	)	
v.	)	Civil Action No. 10-484
	)	
AQUATECH INTERNATIONAL CORPORATION and DEBASISH MUKHOPADHYAY,	)	
	)	
Defendants.	)	

MEMORANDUM OPINION AND ORDER

Conti, District Judge.

Pending before the court are the parties' proposed patent claim constructions.

BACKGROUND

In this declaratory judgment action, plaintiff N.A. Water Systems, LLC ("NAWS") seeks declarations that U.S. Patent Numbers 5,925,255 ("the '255 patent") and 6,537,456 ("the '456 patent") are not infringed by NAWS's OPUS process, and that the patents are invalid under 35 U.S.C. §§ 102, 103, and 112. See Am. Compl. ¶¶ 72-83 (ECF No. 60 at 13-14).[1] Defendant Debasish Mukhopadhyay is the named inventor and owner of the '255 and '456 patents. Defendant Aquatech International Corporation ("Aquatech") is a licensee of the '255 and '456 patents. The Aquatech Parties[2] assert counterclaims against NAWS for infringement of the '255 and '456 patents. See Counterclaim ¶¶ 15-30 (ECF No. 63 at 18-20). Specifically, the Aquatech parties assert that NAWS infringes claims 95, 98, 101, 106, and 111 of the '255 patent, and

[1] NAWS also asserts claims against Defendant Aquatech International Corporation for tortious interference with prospective contractual relationship and defamation. See Am. Compl. ¶¶ 84-110 (ECF No. 60 at 14-17).

[2] Both defendants collectively will be referred to as "the Aquatech parties."

claims 1, 8, and 30 of the '456 patent. See NAWS Opening Claim Construction Br. 1 [hereinafter NAWS Br.] (ECF No. 101 at 1).

Both the '255 patent and the '456 patent claim priority to U.S. Provisional Application 60/077,189, filed on August 12, 1996, and U.S. Provisional Application 60/036,682, filed on March 1, 1997. '255 patent col.1 ll.5-10, Claim Construction H'rg Ex. 2; '456 patent col.1 ll.5-10, (ECF No. 102-3). The court previously ruled that the conception date for the '255 and '456 patents is March 1, 1997. Order, July 28, 2011 (ECF No. 70). The specifications of the '255 patent and '456 patent are substantially identical. The parties' cite only the '255 patent as intrinsic evidence in support of claim construction. See Claim Chart 2 n.1 (ECF No. 99-1). The court, therefore, will do the same.

The '255 and '456 patents, both entitled "Method and Apparatus for High Efficiency Reverse Osmosis Operation," relate to technology for purifying water using membrane separation equipment. See '255 patent abstract, Claim Construction H'rg Ex. 2. Reverse osmosis ("RO") systems involve pumping feedwater, under pressure, through a semi-permeable membrane. The membrane allows water to pass through, but is able to prevent passage of, or reject, most solutes dissolved in the water. This process concentrates the feedwater into a reject stream of solute-containing water that does not pass through the membrane, and produces a product stream, or permeate stream, of relatively pure water that passes through the membrane. See '255 patent col.21 ll.41-62, Claim Construction H'rg Ex. 2; see also Aquatech Parties' Response Br. 7[3] [hereinafter Aquatech Br.] ("Within the membrane system, the feed water will be split into a low-saline and/or purified product stream, and a high saline or concentrated brine, called a reject stream.") (ECF No. 103).

[3] Page number references to the Aquatech parties' brief refer to the CM/ECF page numbers.

One limitation of such systems is that hardness and alkalinity in the feedwater can form compounds that precipitate on the membrane, causing scaling of the membrane. "Hardness" refers to certain positively-charged ions (cations), primarily calcium (Ca^{2+}) and magnesium (Mg^{2+}). See NAWS Br. 2 (ECF No. 101); Aquatech Br. 15 (ECF No. 103); Amendment and Response to Official Action 76 (Nov. 7, 1998) (ECF No. 90-5 at 77). "Alkalinity" refers to certain negatively-charged ions (anions), such as carbonate (CO_3^{2-}), bicarbonate (HCO_3^-), and hydroxide (OH^-). See NAWS Br. 2 (ECF No. 101); Aquatech Br. 15 (ECF No. 103); Amendment and Response to Official Action 76 (Nov. 7, 1998) (ECF No. 90-5 at 77). Because the tendency for scale formation increases as the pH of the reject stream increases, prior art methods to avoid scaling involve minimizing the pH of the reject stream and using anti-scalant additives. '255 patent col.4 ll.11-18, Claim Construction H'rg Ex. 2.

Another limitation of RO systems is that "rejection of weakly ionized species, such as total organic carbon ("TOC"), silica, boron, and the like, is significantly lower than rejections for strongly ionized species as sodium, chloride, etc." '255 patent col.2 ll. 27-30, Claim Construction H'rg Ex. 2. Rejection rates of weakly ionized species can be improved by increasing the pH of the feedwater. '255 patent col.6 ll.3-8; '255 patent col.24 ll.5-12, Claim Construction H'rg Ex. 2.

Thus, operating RO systems at high pH is desirable to improve rejection of weakly ionized species, but prior art systems could not reliably achieve hardness and alkalinity levels low enough to prevent scale formation at high pH levels. '255 patent col.4 ll.49-63, Claim Construction H'rg Ex. 2. The invention described in the '255 and '456 patents seeks to overcome these prior art shortcomings by providing a process to remove hardness and alkalinity

in feedwater, and increase the pH of the feedwater, prior to passing the feedwater through an RO membrane.

There are twelve claim terms in dispute: (1) "A first unit of said membrane separation equipment;" (2) "Reducing the tendency of the feedwater to form scale when said feedwater is concentrated to a preselected concentration factor at a selected pH;" (3) "Removing;" (4) "Alkalinity associated with hardness;" (5) "Removing substantially all alkalinity associated with hardness;" (6) "The product from step (b);" (7) "The product from step (c);" (8) "Raising the pH of the product from step (b);" (9) "An aqueous solution characterized . . . by comprising . . . minimizing alkalinity associated with hardness;" (10) "Stable;" (11) "(d) passing the product from step (c) above through;" and (12) "In a process for purification of an aqueous solution." Each of these terms will be discussed.

ANALYSIS

I. Legal Standards

A. Claim Construction

Proper claim construction looks first and principally to the "intrinsic evidence," i.e., the patent's claim language, specification, and prosecution history, to determine the meaning of disputed claim terms. Phillips v. AWH Corp., 415 F.3d 1303, 1311-17 (Fed. Cir. 2005) (en banc). The words of a claim "are generally given their ordinary and customary meaning," which "is the meaning that the term would have to a person of ordinary skill in the art in question at the time of the invention, i.e., as of the effective filing date of the patent application." Id. at 1312-13 (citing Vitronics Corp. v. Conceptronic, Inc., 90 F.3d 1576, 1582 (Fed Cir. 1996); Innova/Pure Water, Inc. v. Safari Water Filtration Systems, Inc., 381 F.3d 1111, 1116 (Fed. Cir. 1994)). The Federal Circuit explained in Medrad, Inc. v. MRI Devices Corp., 401 F.3d 1313, 1319 (Fed. Cir. 2005), that "[w]e cannot look at the ordinary meaning of the term . . . in a vacuum. Rather, we

must look at the ordinary meaning in the context of the written description and the prosecution history." The court emphasized that the specification "is always highly relevant to the claim construction analysis. Usually, it is dispositive; it is the single best guide to the meaning of a disputed term." Phillips, 415 F.3d at 1315 (quoting Vitronics, 90 F.3d at 1582). Courts should therefore "rely heavily on the written description for guidance as to the meaning of the claims." Phillips, 415 F.3d at 1317.

While claims are to be construed in light of the specification, courts must be careful not to read limitations from the specification into the claim. Id. at 1323. Thus, if a patent specification describes only a single embodiment that does not mean that the claims of the patent necessarily must be construed as limited to that embodiment. Id. The purpose of the specification is "to teach and enable those of skill in the art to make and use the invention" and sometimes, the best way to do that is to provide an example. Id. In Phillips, the Court of Appeals for the Federal Circuit acknowledged that, "the distinction between using the specification to interpret the meaning of a claim and importing limitations from the specification into the claim can be a difficult one to apply in practice." Id. The Court of Appeals for the Federal Circuit went on to emphasize that "the line between construing terms and imparting limitations can be discerned with reasonable certainty and predictability if this court's focus remains on understanding how a person of ordinary skill in the art would understand the claim terms." Id.

In addition to relying on the specification, a court may also consider the patent's prosecution history, which is part of the intrinsic evidence, and "consists of the complete record of the proceedings before the PTO and includes the prior art cited during the examination of the patent." Phillips, 415 F.3d at 1317. Although the prosecution history "often lacks the clarity of

the specification and thus is less useful for claim construction purposes," it nonetheless "can often inform the meaning of the claim language by demonstrating how the inventor understood the invention and whether the inventor limited the invention in the course of prosecution, making the claim scope narrower than it would otherwise be." Id. For example, an applicant limits claim scope during prosecution by a "clear disavowal of claim coverage, such as an amendment to overcome a rejection." Amgen Inc. v. Hoechst Marion Roussel, Inc., 314 F.3d 1313, 1327 (Fed. Cir. 2003) (citing York Prods., Inc. v. Central Tractor Farm & Fam. Ctr., 99 F.3d 1568, 1575 (Fed. Cir. 1996)).

Finally, a court during claim construction may consider extrinsic evidence, which "consists of all evidence external to the patent and prosecution history, including expert and inventor testimony, dictionaries, and learned treatises." Phillips, 415 F.3d at 1317 (quoting Markman, 52 F.3d at 980). Nonetheless, extrinsic evidence is generally less reliable than intrinsic evidence and must always be considered in the context of the intrinsic evidence. Id. at 1318-19.

B. Indefiniteness

Referred to as the "definiteness" requirement, every patent must "conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention." 35 U.S.C. § 112, ¶ 2. The definiteness requirement ensures that the claims adequately notify the public of the scope of the patentee's right to exclude. Praxair, Inc. v. ATMI, Inc., 543 F.3d 1306, 1319 (Fed. Cir. 2008).

Because indefiniteness is a matter of claim construction, general claim construction principles apply to determining whether a claim is indefinite. Id.; Datamize, LLC v. Plumtree Software, Inc., 417 F.3d 1342, 1348 (Fed. Cir. 2005). A claim satisfies the definiteness requirement "[i]f one skilled in the art would understand the bounds of the claim when read in

light of the specification." Praxair, 543 F.3d at 1319 (quoting Exxon Res. & Eng'g Co. v. United States, 265 F.3d 1371, 1375 (Fed. Cir. 2001)). Claims can be definite even if not presented with "absolute clarity" or if they present a "difficult issue of claim construction." Datamize, 417 F.3d at 1347. Thus, a claim is invalid for indefiniteness only if it is not amenable to construction because claim terms cannot be given any reasonable meaning. Id. Further, indefiniteness must be shown by clear and convincing evidence. Id. at 1348.

II. Disputed Claim Terms

A. "A first unit of said membrane separation equipment"

Claim 95 of the '255 patent and claim 1 of the '456 patent require concentrating feedwater in "a first unit of said membrane separation equipment." NAWS' proposed construction is: "The first device that the feedwater stream contacts that includes a membrane (thin barrier), which separates a feedwater stream into a reject stream and a permeate stream." The Aquatech parties' proposed construction is: "A first unit of membrane separation equipment including a semi-permeable membrane that substantially resists the passage of ionized species therethrough."

The parties' primary dispute is over whether the term "a first unit of said membrane separation equipment" requires "a semipermeable membrane that substantially resists the passage of ionized species therethrough," as asserted by the Aquatech parties. The Aquatech parties' brief does not present any legal arguments for why this claim term should require "a semipermeable membrane that substantially resists the passage of ionized species therethrough," but the Aquatech parties identify several portions of the patent specification in support of their construction. See 2d Am. Joint Disputed Claim Terms Chart 1 [hereinafter Claim Chart] (ECF No. 99-1 at 2).

NAWS argues that the Aquatech parties rely on descriptions of preferred embodiments of the invention, and that the Aquatech parties' proposed construction seeks improperly to import limitations from the specification into the claims. See NAWS' Br. 16-17 (ECF No. 101). NAWS asserts that "a first unit of said membrane separation equipment" requires a broader construction, i.e., "a membrane (thin barrier), which separates a feedwater stream into a reject stream and a permeate stream." Id. at 14.

The specification demonstrates that the claim term "a first unit of said membrane separation equipment" should not be limited in the manner suggested by the Aquatech parties. The specification states:

> The pH adjusted feedwater is then sent through membrane separation equipment, typically of the reverse osmosis type, but alternately of nanofiltration or other suitable type or configuration which is otherwise available, or which may in the future become available, and in which the current method may be practiced, to produce a reject stream and a product stream. The membrane separation equipment is ideally of the type which has a semi-permeable membrane which which [sic] substantially resists passage of ionized species therethrough.

'255 patent col.6 ll.47-57, Claim Construction H'rg Ex. 2. (emphasis added). This portion of the specification describes several types of "membrane separation equipment," and explains that "a semipermeable membrane that substantially resists the passage of ionized species therethrough" is part of an ideal embodiment of the invention. None of the portions of the specification cited by the Aquatech parties suggest that "a first unit of said membrane separation equipment," as used in the claims, must include "a semipermeable membrane that substantially resists passage of ionized species therethrough."[4] "A first unit of said membrane separation equipment" should not be limited to this ideal embodiment. See Silicon Graphics, Inc. v. ATI Techs., Inc., 607 F.3d

[4] The Aquatech parties cite the 6 ll.54-61; col.16 ll.9-25; col.22 ll.1-35; and Figure 9, Claim Construction H'rg Ex. 2. See Claim Chart 1 (ECF No. 99-1 at 2).

784, 792 (Fed. Cir. 2010) ("A construing court's reliance on the specification must not go so far as to import limitations into claims from examples or embodiments appearing only in a patent's written description unless the specification makes clear that the patentee intends for the claims and the embodiments in the specification to be strictly coextensive." (citing JVW Enters., Inc. v. Interact Accessories, Inc., 424 F.3d 1324, 1335 (Fed. Cir. 2005) (internal quotation marks and ellipses omitted)); see also Phillips, 415 F.3d at 1323-24 (explaining that reading the specification often reveals whether patentee is setting forth examples, or whether patentee instead intends for claims and embodiments to be strictly coextensive).

Having determined that "a first unit of membrane separation equipment" should not be limited in the manner suggested by the Aquatech parties, the court finds it unnecessary to construe this claim term. For similar reasons why "a first unit of membrane separation equipment" should not be limited in the manner suggested by the Aquatech parties, it appears the claim term should not be limited in the manner suggested by NAWS.[5] The limitations included in NAWS' proposed construction, "a membrane (thin barrier), which separates a feedwater stream into a reject stream and a permeate stream," already are separately included in claim 95 of the '255 patent and claim 1 of the '456 patent. See '255 patent, claim 95 preamble (including "a membrane separator to produce a low solute containing product streams [sic] and a high solute containing reject stream"); '456 patent, claim 1 preamble ("A process for treatment of a feedwater stream in membrane separation equipment, said membrane separation equipment comprising at least one unit having a membrane separator, to produce a low solute containing product stream and a high solute containing reject stream"). There is, therefore, no need to import the limitations proposed by NAWS into the definition of "a first unit of said membrane

[5] Additionally, NAWS proposed construing "unit" to mean "device," but explained at the claim construction hearing that there is no real dispute over the meaning of "unit" and that it is unnecessary to construe "unit" to mean "device." Claim Construction H'rg Tr. 25:7-26:2 (July 10, 2012).

separation equipment." It is unclear if there is a real dispute over the meaning of the term, other than determining whether "a first unit of membrane separation equipment" is limited in the manner suggested by the Aquatech parties.

For the foregoing reasons, the court finds that the term "a first unit of membrane separation equipment" is not limited in the manner suggested by the Aquatech parties, and there is no need to otherwise construe the term at this time.

B. "Reducing the tendency of the feedwater to form scale when said feedwater is concentrated to a preselected concentration factor at a selected pH"

Claim 95 of the '255 patent, and claim 1 of the '456 patent require the step of "reducing the tendency of the feedwater to form scale when said feedwater is concentrated to a preselected concentration factor at a selected pH." The Aquatech parties assert that this claim term does not require construction. See Claim Chart 1 (ECF No. 99-1 at 2). NAWS' proposed construction is: "Avoiding carbonate scaling at the predetermined concentration factor and pH without the use of anti-scalants." Id. NAWS asserts that this claim term should be interpreted to limit the claimed process to processes that do not use anti-scalants. See NAWS Br. 17-20 (ECF No. 101). According to NAWS, the specification supports such a narrow construction. See id. at 17-18. NAWS further argues that during prosecution, the patentee disclaimed all processes that use anti-scalants. See id. at 18-20

1. Specification

The specification does not support NAWS's position. NAWS primarily relies on three portions of the specification. See id. at 17-18. First, the specification lists several "objects of the invention." '255 patent col.6 l.54 – col.7 l.30, Claim Construction H'rg Ex. 2. Among the various objects listed is:

> the provision of a method for water treatment as described in the preceding paragraph which:

. . .

> results in less chemical usage than in most water treatment facilities, by virtually eliminating use of some types of heretofore commonly used chemical additives, particularly scale inhibitors.

'255 patent col.7 ll.3-30, Claim Construction H'rg Ex. 2.

The specification's listing of multiple objects of the invention suggests that the term "reducing the tendency of the feedwater to form scale . . ." should not be interpreted narrowly to exclude any use of anti-scalants. See Phillips, 415 F.3d at 1326-27 ("We have held that '[t]he fact that a patent asserts that an invention achieves several objectives does not require that each of the claims be construed as limited to structures that are capable of achieving all of the objectives.'" (quoting Liebel-Flarsheim Co. v. Medrad, Inc., 358 F.3d 898, 908 (Fed. Cir. 2004)).

NAWS also points to the "Detailed Description" section of the specification, which explains: "Attributes which characterize my HERO (tm) brand RO process design and operation include: . . . (7) Addition of scale inhibitors is virtually eliminated." '255 patent col.8 ll.53-67, Claim Construction H'rg Ex. 2. The "Detailed Description" section further explains:

> I have found that by reliable hardness and non-hydroxide alkalinity removal, to levels which effectively avoid formation of scale at a selected pH for RO operation, the concentration of SiO_2 in the RO reject stream can be safely increased to 450 ppm or more. This is accomplished by increasing the pH of the feedwater to the RO system, and without use of scale-inhibition chemicals.

'255 patent col.10 ll.60-66, Claim Construction H'rg Ex. 2.

These portions of the specification describe a particular embodiment of the invention (i.e., the "HERO (tm) brand RO process"). The specification describes the avoidance of anti-scalants as an objective or benefit of the invention, but does not suggest that the invention is limited to embodiments that do not use anti-scalants. The specification explicitly states that anti-scalants can be used in conjunction with the described invention: "Use of antiscalants or scale

inhibitors, while not harmful or incompatible with the new process, can be completely eliminated, as proven by an 18-month test at a semiconductor manufacturing facility." '255 patent col.27 ll.15-18, Claim Construction H'rg Ex. 2. The specification, therefore, undermines NAWS' position that the claim term "reducing the tendency of the feedwater to form scale . . ." is limited to embodiments that do not use scale inhibitors.

2. Prosecution History

NAWS also asserts that during prosecution, the patentee disclaimed any embodiment that uses anti-scalants. "[I]f a patentee makes a clear and unambiguous disavowal of claim scope during prosecution, that disclaimer informs the claim construction analysis by 'narrow[ing] the ordinary meaning of the claim congruent with the scope of the surrender.'" Advanced Fiber Techs. (AFT) Trust v. J & L Fiber Servs., Inc., 674 F.3d 1365, 1372-73 (Fed. Cir. 2012) (quoting Omega Eng'g, Inc. v. Raytek Corp., 334 F.3d 1314, 1324 (Fed. Cir. 2003)) (second alteration in original).

NAWS relies on two instances during prosecution where the patentee made arguments distinguishing his invention from the prior art Tao patent (U.S. Patent No. 5,250,185). First, the patentee filed a preliminary amendment to the claims, accompanied by the following remarks:

> Claims 1 and 2 have been amended to (1) require at least two elements of step "(a)" to be performed, and (2) requires that substantially all of the alkalinity be removed. The Tao patent, U.S. 5,250,185, and related publications, indicate that Tao performs softening, where hardness is reduced to low levels. In the equipment described by Tao, although most alkalinity associated with hardness will be removed, Tao does not take steps to remove the substantial amount of alkalinity present which is not associated with hardness. Claims 1 and 2, and similar language in other claims, now clearly defines the claimed invention over Tao, since one key to the instant invention is the reduction of alkalinity not associated with hardness, in order to avoid carbonate scaling at pH levels of 8.5 or above, without the necessity to utilize anti-scalant additives.

Preliminary Amendment 27 (Aug. 10, 1998) (ECF No. 90-4 at 28). Second, the patentee later in response to an official action explained:

> In the equipment described by Tao, although most alkalinity associated with hardness will be removed, Tao does not take steps to remove the substantial amount of alkalinity present which is not associated with hardness. . . . Subsequently, Tao's process removes residual hardness, but his process does not take the steps necessary to remove the residual alkalinity that was associated with such residual hardness. Also, Tao discusses the use of scale inhibitor such as EDTA, since he did not see the need for removal of the residual alkalinity after initial hardness removal. The independent claims now presented clearly define the claimed invention over Tao, since one key to the instant invention is the reduction of alkalinity associated with hardness, or still further when appropriate, the reduction of additional alkalinity not associated with hardness, in order to avoid carbonate scaling at pH levels of 8.5 or above, without the necessity to utilize anti-scalant additives.

Amendment and Response to Official Action 67-68 (Nov. 7, 1998) (ECF No. 90-5 at 68-69).

Neither of these portions of the prosecution history evidences a "clear and unambiguous disavowal" of embodiments that use anti-scalants. The primary distinction the patentee made between his invention and the Tao patent is that "one key" to the patentee's invention is the reduction of alkalinity. The patentee noted that the reduction in alkalinity is required "in order to" avoid scaling without the necessity to utilize anti-scalant activities. In other words, consistent with the specification, eliminating use of anti-scalants is an objective and beneficial result of the patentee's invention – not a required element of the invention.

This conclusion also is consistent with statements made by the patentee in an information disclosure statement ("IDS") and a declaration of the inventor.[6] In the IDS, the patentee explained that:

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[6] The IDS and declaration of the inventor were cited by NAWS in the joint claim terms chart, but not in NAWS' brief.

> Although it is inherent in Tao's process that alkalinity associated with temporary hardness is removed (calcium bicarbonate and magnesium bicarbonate), the process does not remove the alkalinity not associated with hardness (mainly, sodium bicarbonate). As a result, the Tao process . . . is also forced to use anti-scalant, to prevent precipitation of calcium carbonate. Tao's process fails to remove the bulk of the alkalinity before charge of feedwater to the reverse osmosis unit, as taught by the claimed invention herein.

IDS 9 (Aug. 9, 1998) (ECF No. 90-3 at 10). The primary distinction made by the patentee again is that the Tao process did not remove alkalinity to the same extent as the patentee's invention. The use of anti-scalant is a disadvantage of Tao, but not a distinction relevant to the scope of the patentee's invention. Similarly, the inventor in a declaration described "essentially scale free operation at very high pH levels" as a "beneficial result[]" of his invention. Declaration Under Rule 132 at 3 (Nov. 7, 1998) (ECF No. 90-6 at 4).

Nothing in the prosecution history demonstrates "a clear and unambiguous disavowal of claim scope." Advanced Fiber, 674 F.3d at 1372. Particularly when the prosecution history is reviewed in context with the specification, eliminating the need for anti-scalants is an objective and beneficial result of the invention, and not a required element of the invention. The claim term "reducing the tendency of the feedwater to form scale when said feedwater is concentrated to a preselected concentration factor at a selected pH" should not be limited to embodiments that do not use anti-scalants. The claim term does not otherwise require construction at this time.

C. Removing

Claim 95 of the '255 patent and claim 1 of the '456 patent require "removing" hardness, alkalinity and/or dissolved gas from feedwater. The parties agree that "removing" should be given its ordinary meaning, but dispute whether the ordinary meaning of "removing" includes chemical conversion. In particular, the parties dispute whether conversion of bicarbonate alkalinity to carbon dioxide constitutes "removing" alkalinity. See Aquatech Br. 22 (ECF No.

103); NAWS Reply Br. 3-5 (ECF No. 116). NAWS argues that the claims and specification confirm that "removing" includes chemical conversion. See NAWS Br. 20-21 (ECF No. 101); NAWS Reply Br. 3-5 (ECF No. 116). The Aquatech parties' argument is unclear, but appears to rely on a declaration of defendant Mukhopadhyay that suggests that "removing" does not include conversion of alkalinity to carbon dioxide, because "merely changing either one into the other does not irreversably [sic] accomplish removal from the feedwater." Aquatech Br. 22 (ECF No. 103).

The language of the claims suggests that "removing" alkalinity includes chemical conversion to carbon dioxide. Several claims in both the '255 patent and the '456 patent recite separate steps of "removing" alkalinity and "removing" dissolved gas. For example, claim 95 of the '255 patent includes the step of

> reducing the tendency of said feedwater to form scale when said feedwater is concentrated to a preselected concentration factor at a selected pH, by effecting, in any order, two or more of the following:
>
> (i) removing an effective amount of hardness from said feedwater stream;
>
> (ii) removing substantially all alkalinity associated with hardness, from said feedwater stream;
>
> (iii) removing dissolved gas from said feedwater stream, whether initially present or created during said hardness or said alkalinity removal step . . .

'255 patent, claim 95 (emphasis added). "Removing" alkalinity, therefore, can create "dissolved gas", suggesting that "removing" alkalinity includes converting alkalinity into "dissolved gas" (e.g., carbon dioxide).

This interpretation of the claims is confirmed by the specification. In particular, the specification describes use of a weak acid cation resin, operated in hydrogen form, to remove

hardness and convert alkalinity to carbonic acid. '255 patent col.9 l.63 – col.10 l.4, Claim Construction H'rg Ex. 2. The specification explains that the carbonic acid breaks down to water and carbon dioxide. '255 patent col.13 ll.49-62, Claim Construction H'rg Ex. 2. The "Summary" section of the specification explains that "raw feedwaters of suitable chemical composition are treated with a weak acid cation ion exchange resin, operated in the hydrogen form, to simultaneously remove hardness and alkalinity." '255 patent col.5 ll.52-55, Claim Construction H'rg Ex. 2. Thus, the step of using a weak acid cation resin, operated in hydrogen form, "removes" alkalinity by converting it to carbon dioxide.

The specification also contemplates that "total alkalinity removal" has been achieved by using a weak acid cation resin followed by adding acid "to destroy the remaining alkalinity," prior to performing the separate step of "carbon dioxide removal." See '255 patent col.10 ll.5-11, Claim Construction H'rg Ex. 2. The specification, therefore, confirms that alkalinity is "removed" when it is chemically converted to carbon dioxide.

"Removing," as used in the patent claims, should therefore be construed to include chemical conversion.

D. "Alkalinity associated with hardness"

Claims 95 and 98 of the '255 patent and claim 1 of the '456 patent require removing or minimizing "alkalinity associated with hardness." The Aquatech parties contend that this term does not require construction. See Claim Chart 2 (ECF No. 99-1). NAWS' proposed construction is: "Alkalinity ions that are or were previously ionically bound with hardness ions." NAWS Reply Br. 9 (ECF No. 116).

1. When to determine "alkalinity associated with hardness"

According to NAWS, the claims and specification support a construction of "alkalinity associated with hardness" to "include all alkalinity that was, *at any time* during the wastewater

treatment process, bound to a hardness ion." NAWS Br. 26 (ECF No. 101). The ordinary meaning of "alkalinity associated with hardness" does not include a temporal element. Particular claims may suggest that "alkalinity associated with hardness" should be measured at a particular time, but nothing in the phrase "alkalinity associated with hardness" suggests when it should be measured.

NAWS first argues that a construction limited only to alkalinity currently associated with hardness would render part of claim 98 of the '255 patent superfluous. Claim 98 includes:

> the improvement which comprises feeding said membrane separation equipment with an aqueous solution characterized at the time of initial entry into said membrane separation equipment, by comprising
>
> (a) minimizing hardness,
>
> (b) minimizing alkalinity associated with hardness,
>
> (c) minimizing dissolved or suspended carbon dioxide
>
> (d) a pH of at least 8.5;

'255 patent, claim 98. According to NAWS:

> If the first term 'minimizing hardness' is satisfied, then it automatically follows that alkalinity then bound with the hardness is also minimized. Thus, if 'alkalinity associated with hardness' only includes that alkalinity that is currently bound to hardness, then the second step of 'minimizing alkalinity associated with hardness' is superfluous. If, however, 'alkalinity associated with hardness' includes all alkalinity that is or was bound with hardness at any time during the process, then the second term 'minimizing alkalinity associated with hardness' is not superfluous.

NAWS Br. 26 (ECF No. 101). NAWS further argues that the specification describes processes that remove alkalinity that was once associated with hardness. Id. at 27.

NAWS' argument is flawed for several reasons. NAWS' argument regarding claim 98 is logically unsound. "Minimizing hardness" in many instances may also achieve "minimizing

alkalinity associated with hardness," but nothing in the patents suggests that "minimizing hardness" necessarily eliminates hardness. Thus, it is possible to further "minimiz[e] alkalinity associated with hardness" after already "minimizing hardness."

Steps in a claimed method may be performed in any order. See Altiris v. Symantec Corp., 318 F.3d 1363, 1369-70 (Fed. Cir. 2003) (explaining that steps in a claimed method may be performed in any order, unless the claim language requires a particular order, "as a matter of logic or grammar," or if the specification "directly or implicitly requires such a narrow construction"). "Alkalinity associated with hardness," therefore, does not have to be construed in the manner suggested by NAWS to avoid rendering part of claim 98 superfluous.

Finally, NAWS may be correct that the specification describes processes to remove alkalinity that was once associated with hardness, but the specification does not use the term "alkalinity associated with hardness," and those examples do not impart a temporal element to the term. NAWS' request to "construe" this term to include alkalinity associated with hardness at any time during the wastewater treatment process perhaps may be better suited for resolution in the context of analyzing a particular claim with respect to particular invalidity or infringement contentions.

2. Meaning of "associated with"

NAWS initially proposed construing "associated with" as "bound with." NAWS Br. 25 (ECF No. 101). The Aquatech parties objected to this construction because "[t]hose skilled in the art in, 1995, knew that when ionic compounds are in solution, i.e. solutes in a solvent, the ions are not bound together." Aquatech Br. 20 (ECF No. 103). NAWS amended its proposed construction to "ionically bound with." NAWS Reply 9 (ECF No. 116).

The parties' dispute seems to be more a matter of semantics than a genuine dispute over the meaning of the term "associated." The parties during the claim construction hearing

vigorously disputed the meaning of "bound," which is not a claim term. Regardless whether "alkalinity associated with hardness" is "bound" to hardness, the parties agree that "alkalinity associated with hardness" is alkalinity that is in solution with hardness. Claim Construction H'rg Tr. 136:1-138:8 (July 9, 2012); Claim Construction Hr'g Tr. 27:13-28:25 (July 10, 2012). The court, therefore, construes "alkalinity associated with hardness" as "alkalinity in solution with hardness."

E. "Removing substantially all alkalinity associated with hardness"

Claim 95 of the '255 patent and claim 1 of the '456 patent require "removing substantially all alkalinity associated with hardness." The parties essentially dispute the meaning of "substantially all" in this context. NAWS asserts that, consistent with the specification, this term must be construed to mean "removing alkalinity associated with hardness to essentially zero." NAWS Br. 27-32 (ECF No. 101); NAWS Reply 6-9 (ECF No. 116). NAWS asserts that, if this term is not construed to mean removing alkalinity "to essentially zero," then the claims containing this term are invalid for indefiniteness. NAWS Br. 32-33 (ECF No. 101). The Aquatech parties assert that this term requires no construction, and that one of ordinary skill in the art would understand the meaning of "substantially all" alkalinity. Aquatech Br. 16-17 (ECF No. 103).

1. Construction of "substantially all"

NAWS argues that the patentee disclaimed any construction that does not require complete removal of alkalinity because the specification repeatedly explains that complete alkalinity removal is a requirement and necessity. NAWS Br. 29-32 (ECF No. 101); NAWS Reply 6-9 (ECF No. 116).

NAWS' argument fails because many of the claims do not necessarily require removal of any alkalinity. For example, claim 95 of the '255 patent requires:

> reducing the tendency of said feedwater to form scale when said feedwater is concentrated to a preselected concentration factor at a selected pH, by effecting, in any order, two or more of the following:
>
> (i) removing an effective amount of hardness from said feedwater stream;
>
> (ii) removing substantially all alkalinity associated with hardness, from said feedwater stream;
>
> (iii) removing dissolved gas from said feedwater stream, whether initially present or created during said hardness or said alkalinity removal step;

'255 patent, claim 95 (emphasis added). The claimed method, therefore, can be performed by "removing . . . hardness" and "removing dissolved gas," without removing any alkalinity. The claims themselves demonstrate that the patentee did not disclaim embodiments that do not remove alkalinity to "essentially zero."

The specification does not evidence a clear disavowal of claim scope. One passage of the specification stresses the importance of "near-zero alkalinity":

> Another aspect of the new process that merits further discussion is the requirement for essentially complete removal of alkalinity prior to pH adjustment (increase) of the RO feed. From an entirely practical point of view, near-zero alkalinity is a necessity since any residual alkalinity will provide a strong buffering effect and substantially increase the quantity of alkali needed to raise the pH to the normal operating range. Over and above the direct cost of increased alkali requirement, the sodium content of the RO permeate will be much higher also, resulting in unnecessarily high post-RO ion exchange load and cost.
>
> From a conceptual point of view, however, the requirement for alkalinity removal is far more urgent but straightforward.

'255 patent col.28 l.55 – col.29 l.1, Claim Construction H'rg Ex. 2. In this passage, it is unclear if "the new process" refers to all embodiments of the invention, or to the "HERO brand RO process" (i.e., a preferred embodiment of the invention).

Other portions of the specification cited by NAWS explicitly refer only to specific embodiments of the invention. For example, the "Summary" section of the specification states:

> The preferred treatment train design used in my wastewater treatment plant overcomes a number of important and serious problems. First, the low hardness, combined with virtual elimination of non-hydroxide alkalinity, substantially eliminates the precipitation of scale forming compounds associated with sulfate, carbonate, or silicate anions.

'255 patent col.5 ll.60-65, Claim Construction H'rg Ex. 2. (emphasis added). The other portions of the specification cited by NAWS specifically refer to the "HERO brand RO process" (i.e., a preferred embodiment of the invention). See NAWS Br. 29-30 (ECF No. 101).

Finally, other portions of the specification indicate the importance or desirability of reducing alkalinity to low levels, but not necessary to "essentially zero." For example, "[a] feature of one embodiment of the present invention is the use of a unique combination of weak acid cation ion-exchange with substantially complete hardness and alkalinity removal, ..." '255 patent col.31-34, Claim Construction H'rg Ex. 2. (emphasis added). The specification also explains that "[b]uffering anions (specifically bicarbonate, or carbonate, and/or phosphate species) should be reduced to as low of a level as can be practically achieved," '255 patent col.9 ll.49-51, Claim Construction H'rg Ex. 2. (emphasis added), and a "key process parameter[]" is to "eliminate non-hydroxide alkalinity to the maximum extent feasible." '255 patent col.13 ll.43-47, Claim Construction H'rg Ex. 2.

The specification, therefore, does not evidence an unambiguous disavowal of any embodiment that does not reduce alkalinity to "essentially zero."

2. Indefiniteness

NAWS asserts that if "removing substantially all alkalinity associated with hardness" is not construed to require removing alkalinity to essentially zero, then the claims are invalid for

indefiniteness. NAWS argues that the specification provides no criteria for determining the meaning of "substantially all." See NAWS Br. 32-33 (ECF No. 101).

The Aquatech parties argue that one of ordinary skill in the art would have known how to determine the amount of alkalinity that would have to be removed by referring to the specification's discussion of the Langelier Saturation Index ("LSI"). See '255 patent col.3 l.61 – col.4 l.48, Claim Construction H'rg Ex. 2. The specification explains how to calculate the LSI to determine the tendency of feedwater to form scale at a given concentration factor and pH, and states that "with use of certain types of anti-scalant additives, an LSI of up to about +1.5 can be tolerated, without $CaCO_3$ scale formation resulting." '255 patent col.4 ll.14-17, Claim Construction H'rg Ex. 2. In both claim 95 of the '255 patent and claim 1 of the '456 patent, "removing substantially all alkalinity associated with hardness" is for "reducing the tendency of said feedwater to form scale when said feedwater is concentrated to a preselected concentration factor at a selected pH." In the context of this claim language, the portion of the specification cited by the Aquatech parties provides guidance on the meaning of "removing substantially all alkalinity associated with hardness."

This issue was specifically addressed during prosecution. The examiner apparently agreed with the patentee that the specification's discussion of the LSI provides "one method which could be used by those of skill in the art to determine, for a given feedwater, just what degree of hardness and/or alkalinity removal needed to be achieved," and that the term "substantially all" was definite because "the specification clearly sets forth sufficient information to allow one of ordinary skill in the art to determine the extent of pretreatment requirements of any unique feedwater to an extent needed to avoid scale formation in membrane separation

equipment, in the manner set forth in the various claims presented." Amendment and Response to Official Action 80, 82 (Nov. 7, 1998) (ECF No. 90-5 at 81, 83).[7]

Relying on the testimony and Affidavit of Charles D. Blumenschein (ECF No. 102-7), NAWS asserts that the patents provide no criteria for determining the meaning of "substantially all." Mr. Blumenschein does not address why the portions of the specification cited by the Aquatech parties are insufficient to inform one of ordinary skill in the art about the meaning of "substantially all." See Blumenshein Aff. ¶ 30 (ECF No. 102-7); Claim Construction H'rg Tr. 50:22-51:23 (July 9, 2010). NAWS has not provided "clear and convincing evidence" that one of ordinary skill in the art could not understand the meaning of "substantially all." See Datamize, 417 F.3d at 1348 (explaining that indefiniteness must be demonstrated by clear and convincing evidence).

The court, therefore, finds that "removing substantially all alkalinity associated with hardness" is not indefinite. Based on the specification and prosecution history, the Court construes this term to mean "removing an amount of alkalinity associated with hardness sufficient to achieve an LSI of about +1.5 or less."

F. "The product from step (b)"

Claim 95 of the '255 patent and claim 1 of the '456 patent require raising the pH of "the product from step (b)."[8] The parties essentially dispute what water is "the product" of step (b). Step (b) in claim 95 of the '255 patent states:

> (b) concentrating said feedwater stream in a first unit of said membrane separation equipment after reducing the tendency of said feedwater to form scale when said feedwater is concentrated

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[7] The claims were allowed following this amendment and an examiner's amendment. See Notice of Allowability (Feb. 3, 1999) (included in '255 patent prosecution history, Claim Construction H'rg Ex. D Tab 12).

[8] Claim 1 of the '456 patent refers to "the product from step (a)," but the parties agree that this is a typographical error and should be construed as "the product from step (b)." See Claim Chart (ECF No. 99 at 1).

> to a preselected concentration factor at a selected pH, by effecting, in any order, two or more of the following:
>
> > (i) removing an effective amount of hardness from said feedwater stream;
> >
> > (ii) removing substantially all alkalinity associated with hardness, from said feedwater stream;
> >
> > (iii) removing dissolved gas from said feedwater stream, whether initially present or created during said hardness or said alkalinity removal step;

'255 patent, claim 95, Claim Construction H'rg Ex. 2.[9]

NAWS asserts that "the product of step (b)" is the concentrated, reject stream produced by performing step (b) of the claimed methods. See NAWS Br. 21-23 (ECF No. 101). The Aquatech parties assert that "the product of step (b)" is the treated feedwater that results from "reducing the tendency of said feedwater to form scale" by performing two or more of steps (i), (ii), and (iii) in step (b). See Claim Chart 4 (ECF No. 99-1 at 5).

The Aquatech parties' proposed construction ignores the first part of step (b) – "concentrating said feedwater stream." According to the specification, "concentrating" feedwater refers to concentrating total dissolved solids in the reject stream when the feedwater is processed through a membrane separation system:

> When utilizing the present method, osmotic pressure of the RO reject represents the ultimate limitation for RO technology. Once appropriate raw feedwater treatment has effectively removed sparingly soluble species, such as calcium carbonate, calcium sulfate, barium sulfate, silica, etc., then concentration of reject can proceed until the osmotic pressure limitation is reached. At this time, the design pressures for commercially proven RO systems are typically limited to approximately 1,200 psig. If a design allowance is made for a 200 psig driving force with respect to the reject stream, then the maximum allowable osmotic pressure

[9] Step (b) of claim 1 of the '456 patent is almost identical to claim 95 of the '255 patent. The only differences are that, in claim 1 of the '456 patent, step (i) reads "removing hardness from said feedwater stream," and there is no comma in step (ii).

> would be approximately 1000 psig. For purposes of example, based on a simplified rule of thumb that approximately one (1) psig of osmotic pressure is exerted by one hundred (100) ppm of TDS, the maximum allowable [total dissolved solids] of the reject stream would be approximately 100,000 ppm. Thus, this new RO operating technology, regardless of feedwater chemistry, is potentially capable of concentrating any feedwater to approximately 100,000 ppm without concern with respect to the various sparingly soluble species, and in particular, with respect to calcium sulfate, barium sulfate, and silica.

'255 patent col.21 ll.41-62, Claim Construction H'rg Ex. 2. (emphasis added); see also Aquatech Br. 7 ("Within the membrane system, the feed water will be split into a low-saline and/or purified product stream, and a high saline or concentrated brine, called a reject stream.") (ECF No. 103).

The parties agree that "concentrating" feedwater refers to passing feedwater through a membrane. Claim Construction H'rg 3:22-3:24, 5:17-6:19 (July 10, 2012). The product of "concentrating said feedwater" conceivably could be the concentrated, reject stream that does not pass through the membrane, or the purified, permeate stream that passes through the membrane. Based on the language of step (b), the logical "product" of "concentrating" feedwater is the concentrated feedwater produced by performing step (b). Construing "the product from step (b)" to mean the permeate stream produced by "concentrating said feedwater" would be illogical in the context of the claims. In step (b), "said feedwater" is concentrated. In step (c), the pH of "the product from step (b)" is raised. In step (d), the "product of step (c)" is passed through membrane separation equipment "to concentrate said feedwater to said preselected concentration factor." "Said feedwater" in step (d) must be the same "feedwater" referenced earlier in the claim. The only way for "said feedwater" in step (d) to be the same "feedwater" that is concentrated in step (b) is for "the product from step (b)" to be the concentrated feedwater produced by performing step (b), i.e., the concentrated reject stream.

The court, therefore, construes "the product from step (b)," to mean "the concentrated feedwater that is produced by performing step (b)."

G. "The product from step (c)"

This term does not require construction independently of "the product from step (b)."

H. "Raising the pH of the product from step (b)"

This term does not require construction independently of "the product from step (b)."

I. "An aqueous solution characterized . . . by comprising . . . minimizing alkalinity associated with hardness"

Claim 98 of the '255 patent includes "an aqueous solution characterized . . . by comprising . . . minimizing alkalinity associated with hardness." The parties dispute the meaning of "minimizing alkalinity associated with hardness." NAWS contends that this claim term should be construed in the same manner as "removing substantially all alkalinity associated with hardness." NAWS Br. 27-33. The Aquatech parties contend that this claim term does not require construction, and treats "minimizing" the same as "removing substantially all." See Claim Chart 5 (ECF No. 99-1); Claim Construction H'rg Tr. 145:25-147:21 (July 9, 2012).

With the claim term "removing substantially all alkalinity associated with hardness," the language of the claims and the prosecution history indicated that "removing substantially all" should be construed in reference to the specification's discussion of the LSI. See supra, Part E. In contrast, nothing in claim 98 of the '255 patent or the prosecution history indicates that the term "minimizing alkalinity associated with hardness" should be construed in reference to the specification's discussion of the LSI. "Minimizing," therefore, cannot be construed in the same manner as "removing substantially all."

The court notes that "minimizing" is an commonly understood word, and construes "an aqueous solution characterized . . . by comprising . . . minimizing alkalinity associated with

hardness" to mean "an aqueous solution characterized . . . by comprising . . . reducing, as much as possible, alkalinity associated with hardness." This construction, based on the ordinary meaning of "minimizing," is supported by the dictionary definition of "minimizing." See Webster's Third New International Dictionary 1438 (Philip Babcock Gove et al., eds., 1993) (defining "minimize" as "to reduce to the smallest possible number, degree, or extent"); see also Phillips, 415 F.3d at 1314 ("In some cases, the ordinary meaning of claim language as understood by a person of skill in the art may be readily apparent even to lay judges, and claim construction in such cases involves little more than the application of the widely accepted meaning of commonly understood words. In such circumstances, general purpose dictionaries may be helpful." (citation omitted)).

J. "Stable"

Claim 111 of the '255 patent requires several process characteristics to be "stable":

> The process . . . wherein said process is further characterized by
>
> (a) a stable normalized rate of permeate production;
>
> (b) a stable silica rejection rate; and
>
> (c) a stable differential pressure.

'255 patent, claim 111. The parties dispute whether use of the term "stable" renders claim 111 indefinite under 35 U.S.C. § 112.

NAWS asserts, based on dictionary definitions, that "stable" means "unlikely to change over a specified period of time." NAWS Br. 33-34 (ECF No. 101). According to NAWS, use of "stable" renders claim 111 indefinite because the specification provides no "points of comparison – both in terms of quantum and time – which define the boundary between something that is stable and something that has changed." NAWS Br. 34 (ECF No. 101).

The Aquatech parties contend that the specification provides "guidance for an evaluation of the term 'stable.'" Aquatech Br. 22 (ECF No. 103). The specification refers to Figures 5, 6, 7, and 8 in describing a "pilot test" that, "[i]n comparison to conventional RO," achieved "a stable normalized permeate flow rate, a stable silica rejection rate, and a stable differential pressure." '255 patent col.19 ll.15-19, Claim Construction H'rg Ex. 2. The specification provides some guidelines – both in terms of "quantum and time" – for the boundaries of "stable." Figure 5 illustrates axial differential pressure versus time, Figure 6 shows normalized permeate flow versus time, Figure 7 shows reject stream silica concentration over time, and Figure 8 illustrates silica rejection rate versus time. See '255 patent col.19 ll.9-31, Claim Construction H'rg Ex. 2. These figures provide guidelines, both in terms of the amount of change tolerable for a "stable" characteristic, and the time period for which the characteristic remains "stable."

Specifically, one of ordinary skill in the art would look to Figure 6 to see if the "normalized rate of permeate production" remains within the exemplary range of variance shown in Figure 6 over a six-month period of time. Figure 5 similarly provides guidance on the acceptable range of variance in "differential pressure" over a three-month period of time. Figure 8 likewise provides guidance on the acceptable range of variance in "silica rejection rate" over a six-month period of time. Because the specification provides "a general guideline and examples sufficient to enable a person of ordinary skill in the art to determine the scope of the claims," construction of the claim term "stable," "without reference to a precise numerical measurement," does not render claim 111 indefinite. Enzo Biochem, Inc. v. Applera Corp., 599 F.3d 1325, 1335 (Fed. Cir. 2010).

NAWS relies on the testimony and affidavit of Mr. Blumenschein (ECF No. 102-7) in support of its position that "stable" renders claim 111 indefinite. Mr. Blumenschein

acknowledges that the '255 and '456 patents describe the results of one pilot test, but states that, "[t]ypically, the results of one pilot test would not be used to establish a standard or objective criteria for determining a process variable." Blumenschein Aff. ¶ 33 (ECF No. 102-7). The goal of claim construction, however, is not to "establish a standard or objective criteria for determining a process variable." Id. The goal is to determine the meaning of the claim terms, as used in the patents. Mr. Blumenschein agrees that Figures 5, 6, and 7 of the '255 patent provide time periods. Claim Construction H'rg Tr. 86:18-88:2 (July 9, 2012). Mr. Blumenschein's affidavit and testimony are not clear and convincing evidence that "stable" renders claim 111 indefinite.[10] See Datamize, 417 F.3d at 1348 (explaining that indefiniteness must be demonstrated by clear and convincing evidence).

K. "(d) passing the product from step (c) above through . . . ." and "In a process for purification of an aqueous solution . . . ."

The Aquatech parties assert that step (d) in claim 1 of the '456 patent should include the limitation that step (d) is performed "while continuously operating with stable normalized permeate flow rate." Aquatech Br. 35-36 (ECF No. 103). The Aquatech parties similarly assert that claim 98 of the '255 patent should include the limitation that the membrane separation equipment is "continuously operating with stable normalized permeate flow rate." Claim Chart 7 (ECF No. 99-1). The Aquatech parties cite the '255 patent, column 19, lines 9-23 in support of both of these proposed constructions. This passage from the specification describes the results of a pilot test (i.e., a particular embodiment of the invention), and nothing in the patents suggests that the claims should be interpreted to include the limitation "while continuously operating with

[10] NAWS also argues that the specification provides insufficient information regarding the "equipment malfunction" noted in Figures 6, 7, and 8, that the specification does not explain how frequently to clean the membrane, and that the specification's description of pilot plant operation shutdown and membrane cleaning following a ten percent or more decline in normalized permeate flow indicates that the pilot test encountered the very problem the patent is designed to avoid. Claim Construction H'rg 11:9-13:9, 22:1-25:5 (July 10, 2012). These arguments may present an issue of enablement, but do not provide clear and convincing evidence of indefiniteness.

stable normalized permeate flow rate." The court, therefore, will not limit the claims in the manner proposed by the Aquatech parties.

ORDER

AND NOW on this 20th day of August, 2012, for the reasons stated above, the court hereby makes the following findings with respect to the disputed claim terms:

1. "A first unit of said membrane separation equipment" is not limited in the manner suggested by the Aquatech parties. This claim term does not require further construction at this time.
2. "Reducing the tendency of the feedwater to form scale when said feedwater is concentrated to a preselected concentration factor at a selected pH" is not limited to embodiments that do not use anti-scalants. This claim term does not require further construction at this time.
3. "Removing" includes chemical conversion. This claim term does not require further construction at this time.
4. "Alkalinity associated with hardness" means "alkalinity in solution with hardness."
5. "Removing substantially all alkalinity associated with hardness" is not indefinite, and means "removing an amount of alkalinity associated with hardness sufficient to achieve an LSI of about +1.5 or less."
6. "The product from step (b)" means "the concentrated feedwater that is produced by performing step (b)."
7. "The product from step (c)" does not require construction independently of "the product from step (b)."

8. "Raising the pH of the product from step (b)" does not require construction independently of "the product from step (b)."
9. "An aqueous solution characterized . . . by comprising . . . minimizing alkalinity associated with hardness" is not indefinite, and means "an aqueous solution characterized . . . by comprising . . . reducing, as much as possible, alkalinity associated with hardness."
10. "Stable" does not render claim 111 of the '255 patent indefinite. The parameters for "stable" with respect to the characteristics recited in claim 111 are provided by Figures 5-8 of the '255 patent, and the specification's accompanying description of the pilot test.
11. "(d) passing the product from step (c) above through . . . ." is not limited in the manner proposed by the Aquatech parties. This claim term does not require further construction at this time.
12. "In a process for purification of an aqueous solution . . . ." is not limited in the manner proposed by the Aquatech parties. This claim term does not require further construction at this time.

By the court,

/s/JOY FLOWERS CONTI
Joy Flowers Conti
United States District Judge